Part 1: Tutorial

FRANKLIN ACECalc

REFERENCE MANUAL

FRANKLIN
COMPUTER CORPORATION

ACECalc™

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1. INTRODUCTION

This manual has two main sections: the Tutorial, and the Reference Guide.

Please take time to read the Tutorial, as it introduces many of the terms used in reference to ACECALC, and points out concepts that might *not* be immediately apparent.

The Tutorial is a beginner's introduction to ACECALC "automated calculator" system. It will teach you the basics and get you started using ACECALC. The Tutorial will not teach you all there is to know about ACECALC; for more information, commands and features of the system, see the Reference Guide section.

To get the most out of the Tutorial, you should read it while sitting at your computer, running ACECALC, and actually carrying out the step-by-step instructions given in the manual. The only way to learn ACECALC is by "hands-on" experience!

As you work through the Tutorial, try to resist the temptation (at least at first) to depart from the instructions and experiment on your own. Stick closely to the instructions, to maintain the continuity of the lesson. Later, after you've acquired a bit of proficiency with ACECALC, by all means feel free to go off and experiment — it's the best way to learn!

By the time you finish the Tutorial, you'll know enough about ACECALC to begin building your own models for your own particular applications. You can then learn more from the ACECALC Reference Guide. The Reference Guide is a concise summary of all aspects of ACECALC.

Inside the back cover there is a Reference Card which you can remove and keep by your computer for quick reference.

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With a little practice, you'll be able to use ACECALC to put your Ace 1000 (or Ace 1200) to work for you in a wide variety of useful ways.

ACECALC is a program that turns your Ace 1000 computer into an "automated calculator". With it you can create, manipulate, modify, and print reports covering a wide variety of calculations, such as:

- Financial statements
- Budgets
- Cost estimates
- Sales forecasts
- Staffing plans
- Development and product schedules and many, many more.

ACECALC provides you with a spacious "electronic worksheet" of 254 rows and 63 columns — a total of 16,002 cells for information storage. Your video screen becomes a "window" that you can slide up, down, left, or right over the worksheet.

One of the exciting features of ACECALC is that it allows you to play "what if...?" with your data. What if interest rates rise two points? How will that affect the data for future years? What if sales increase by five percent? In the blink of an eye, ACECALC will recalculate all of your data and show you the results of your "what if...?" assumptions. You can then save the new data on a floppy diskette, print them, or both.

This manual will show you, step by step, how to create a simple business financial forecast model like the one shown in Figure 1. After you have built this model on your screen, you'll learn how to play "what if...?" by changing some of the data and letting ACECALC instantly calculate the effects of those changes.

PROGRAM DOCUMENTATION
PLANNING MODEL

TASK	HOURS	RATE	COST
RESEARCH	65	24.48	1591.20
FIRST PASS	112	24.48	2741.76
EDITING	56	24.48	1370.88
REWRITING	68	24.48	1664.64
TYPESETTING	52	19.00	988.00
PRINTING			10547.00
TOTAL	353		18903.48

Figure 1. The Demonstration Model

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2. ACE 1000 BASICS

This section covers some of the basic things you need to know about your Ace 1000 computer in order to run ACECALC. If you're an experienced Ace user, you already know how to set up your computer, how to use the keyboard, and how to handle floppy diskettes: just read the following subsection, titled WHAT YOU WILL NEED, then skip ahead a few pages to STARTING ACECALC.

2.1 What You Will Need

In order to run ACECALC, you will need the following:

• An Ace 1000, or Ace 1200 computer, preferably with one or more RAM cards.

• A closed-circuit video (TV) monitor and connecting cable.

• One or more disk drives, with controller cards set up to read 16-sector "floppy" diskettes.

Note: Instead of a closed-circuit monitor, you can use an ordinary home TV, along with a radio-frequency (RF) modulator. The dealer who sold you your Ace 1000 can provide you with an RF modulator and show you how to connect it. Connecting your TV set to your Ace computer won't harm the TV in any way.

Although ACECALC only displays information on the screen in black-and-white, a color monitor or TV set will also work. In general, you will get a clearer display with a black-and-white than with a color unit, and a monitor will give better results than a TV set with modulator. A screen size of 12 inches is recommended, but a 9-inch screen will also give acceptable results.

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The following optional equipment will add to ACECALC's usefulness:

* A RAM card. ACECALC supports all language-card compatible RAM cards in various combinations up to 512K (four 128K RAM cards). The usable portion of your worksheet will be expanded by the addition of one or more RAM cards.
* A printer will enable you to print permanent "hard copies" of your ACECALC models.

In addition, you'll need the ACECALC program diskette that came with this manual, and a blank diskette to use for storing the models you create.

2.2 Setting up your Ace Computer

If you've just unpacked your Ace 1000 computer, here's how to set it up to run ACECALC:

1. Connect one end of the computer's power cord to the power connector at the left rear of the computer, and plug the other end into a grounded (3-prong) power outlet.
2. Plug in the video monitor and connect it to the jack marked VIDEO OUT on the back of the computer with the proper connecting cable. (If you're using an ordinary TV set with an RF modulator, follow the installation instructions that came with the modulator.)
3. If you have a RAM card, follow the installation in-structions supplied by the manufacturer (note: ACECALC will find your RAM card in whichever slot you place it). NOTE: The RAM card can not be install-ed in slot 0 unless the internal jumper on the main board is moved to the "Y3" position.
4. Install the disk drive(s), following the instructions given in the manual that came with the disk drive(s), or the instructions provided by the manufacturer.
5. If you have a printer, connect it to the computer by following the instructions given in the printer manual and the interface card manual.

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Note: The customary slot for printer interface cards is 1, and that is what ACECALC ordinarily expects. You may, however, configure ACECALC to recognize your printer in any slot except 0 (see Configuration Subsystem discussion in the Reference Guide for details).

Note: The customary slot for 80-column video boards is 3, however ACECALC does not look for an 80-column board unless you so specify (see Configuration Subsystem discussion in the Reference Guide for details). 80- column boards will not be recognized in slot 0.

When you've completed these installation steps, your computer is ready to run ACECALC.

2.3 The Ace 1000 Keyboard

The Ace 1000 Keyboard is similar to an ordinary typewriter keyboard, but it has a few peculiarities that you should know about.

First, the Ace 1000 keyboard contains uppercase (capital) as well as lowercase letters. To produce lowercase characters, just press the key all by itself; to produce the upper character, press the key while holding down the SHIFT key at the same time.

Note: This action of pressing and holding down one key while typing another is called a combination keystroke. We will use a notation such as SHIFT-M to represent the combination keystroke with the SHIFT and M keys described in the preceding paragraph.

The Ace 1000 keyboard also contains a few special keys not found on an ordinary typewriter. One of the most important of these is marked CTRL, which stands for ConTRoL. This key is used to type special control characters that tell the computer what you want it to do. These control characters have no graphical representation, and cannot be displayed on the screen or printed on paper. To type one, you use the Ctrl key in the same way as the SHIFT key: press Ctrl and hold it down while typing some other character. Such a combination keystroke with the Ctrl and A keys would be represented by the notation Ctrl — A.

The RETURN key on the Ace 1000 keyboard corresponds to the carriage return on a typewriter. On a typewriter this key is used to end a line by returning the carriage to the beginning of the next line. As you'll see, the RETURN key on the Ace 1000 is used for a similar end-of-line function in ACECALC.

The ESC (ESCape) key and those marked with left- and right- pointing arrows have special uses in ACECALC, which you will learn about in due course. When you're running ACECALC, the key marked RESET has no effect at all, and you should never have occasion to press it.

2.4　Handling Diskettes

With one or more disk drives, your Ace 1000 has the ability to store and retrieve information on 5-1/4-inch "floppy" diskettes. Each diskette is a mass-storage medium with a capacity of 143 kilobytes ("143K") of information. (They're called "floppy" diskettes because they're made of flexible plastic, to distinguish them from harder "rigid" disks.)

Diskettes are a very convenient way of storing information, but they have to be handled with respect. They're sensitive to heat, dust, smoke, scratches, fingerprints, and magnetic fields. Each diskette comes sealed in its own black jacket. You should never take a diskette out of its jacket, bend it (much less fold, spindle, staple, or otherwise mutilate!), or touch its surface through any of the holes in the jacket. Never write on a diskette label (once the label is attached to the diskette) with anything but a felt-tip pen — and don't press too hard! See your Ace Disk Operating System (DOS) Manual for further tips on the proper care and handling of diskettes.

3. STARTING ACECALC

Once you have all the necessary equipment installed and connected properly, you're ready to start up ACECALC.

To start ACECALC:

1. Turn on your video monitor.
2. Open the door to the main disk drive. (The main drive is drive 1 in the highest-numbered peripheral slot containing a disk controller card. By convention, this is slot 6.)
3. Carefully insert your ACECALC diskette into the disk drive, with the label nearest you and facing up, and push it gently into the disk drive as far as it will go. (If you hold the diskette with your thumb on the label, you will have it facing properly.)
4. Gently close the disk drive door.
5. Turn on your Ace 1000 computer. (The power switch is a small "toggle switch" located on the back of the computer, near the left side.)

The computer will issue a short beep, the red light on the front of the disk drive will come on, and the disk drive will begin making whirring and chattering noises. (Don't be concerned by these noises — they are perfectly normal.) In about 5 to 10 seconds the light will go off, and the noises will subside.

6. The message: LOADING will appear on your screen, then a title page. At the bottom of the title page will be the prompt:

INSERT CONFIGURATION/DRIVER DISKETTE (RETURN) OR ,S,D,V

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What you are being prompted to do is to place the diskette with the configuration options for your system in your disk drive, then press the key marked RETURN. The configuration and driver options will be discussed in the Reference Guide. For our purposes, we can use the supplied configurations, so just press RETURN.

7. After the light goes off, open the door again, carefully remove your program diskette, and put it away in a safe place.

4. THE MAIN MENU

If all has gone well, your screen should look more or less like figure 2. Let's take a moment to examine ACECALC System Menu before going on into the Calculate Subsystem.

ACECALC SYSTEM MENU

1. CALCULATE SUBSYSTEM
2. FILE SUBSYSTEM
3. PRINT SUBSYSTEM
4. FORMAT SUBSYSTEM
5. CONFIGURATION SUBSYSTEM
6. BOOT NEXT PROGRAM

SELECT NUMBER OR LETTER, PRESS RETURN
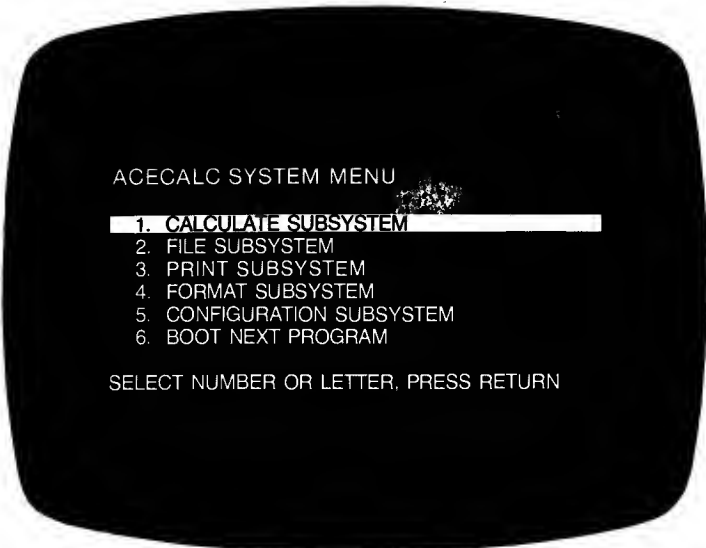
Notice the use of the word subsystem in the menu. ACECALC is a *system* comprised of several smaller systems, or subsystems. You will spend most of your time using the Calculate Subsystem, which will often be referred to as *calculate* mode, to distinguish it from *menu mode*. You will also need the File, Print, Format, and Configuration subsystems to do everything you want.

Notice that menu item 1 — Calculate Subsystem is marked with a *highlight* bar. You may move about in the menu, or press the RETURN key to accept the selection marked by this highlight bar. Press the RETURN key now to enter the Calculate Subsystem.

5. THE WORKSHEET DISPLAY
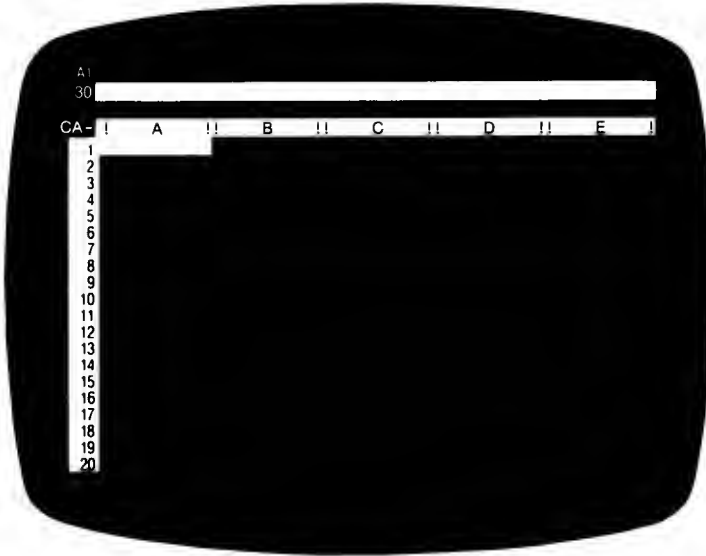
Let's spend a few minutes looking at the various parts of the worksheet display and the information they contain.

5.1 The Information Box

At the very top of the screen is a region, two lines high, called the *information box*. ACECALC uses this region to keep you informed about where you are and what you can do next.

5.2 The Contents Line

The first line of the information box is called the *contents line*. It tells you which cell of the worksheet is the current cell (more on the current cell in a little while) and what that cell contains. Right now the contents line should be displaying the coordinate A1 at the extreme left; the rest of the line is blank, since you've just started up and every cell of the worksheet (including cell A1) is empty.

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5.3   The Prompt Line

Directly below the contents line is the *prompt* line. The prompt line is displayed as a white line, and the characters will appear in black. This line tells you what your options are from moment to moment. It is called the prompt line because ACECALC uses it to "prompt"you about what you can do next. Right now the prompt line should be blank since you've just started.

5.4   The Memory Indicator

The number at the left end of the prompt line is the *memory indicator*. It tells you how much space is left in the computer's memory for storing information on the worksheet. This number should be 30 or more (with added RAM cards). This means that right now you have 30 kilobytes of memory available. (One kilobyte is equivalent to about 1000 characters of information.)

Note: As you fill up the worksheet, the number displayed in the memory indicator will get smaller. If it ever falls to zero, the computer's memory is full and there is no room to enter any more information on the worksheet. If this should happen, ACECALC will display an error message informing you of the problem.

5.5   The Entry Line

Directly below the white prompt line is a black line called the *entry line*. This line is like a temporary storage area for information you wish to place on the worksheet. Any information you type from the keyboard will appear on the entry line. If you wish, you can change, or edit the contents of the entry line at any time (to correct typing mistakes, for example). Then, when you're satisfied the information is correct, you enter it into the worksheet, usually by pressing the RETURN key.

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5.6   The Worksheet Window

Along the left edge of the screen is a vertical white col-
umn containing the numbers from 1 to 20. Above the
column of numbers is a white horizontal stripe contain-
ing the letters A to E. These white borders mark the
boundaries of *your* window into the worksheet. Each
number on the left marks a row of the worksheet, and
each letter at the top marks a column. Right now, twen-
ty rows and five columns are visible in your worksheet
window. The combination of a column letter and a row
number (for example A1 or C17) is called a *coordinate*,
and identifies a *cell* of the worksheet.

On the very left of the horizontal window border (con-
taining the column letters), are three characters in a
black box. These characters indicate various status in-
formation.

The leftmost of these is the *recalculation order in-
dicator*. It will either be a C or an R. This indicates
whether your worksheet will be recalculated column by
column, or row by row. Recalculation will be discussed
in greater detail in the Reference Guide.

The middle character is the *recalculation mode indica-
tor*. It will either be an A or an M. This indicates whether
recalculation will take place automatically whenever a
new value is entered, or manually (upon request).

The rightmost of the three status characters is the
direction indicator. It will either be a — or a !. This
character indicates the direction the marker will move if
an arrow key is pressed. This will often be referred to as
the *marker direction*. If the direction indicator is a —,
and an arrow key is pressed, the marker will move hori-
zontally across the worksheet.

Note: For the purposes of this tutorial we will be work-
ing in 40 columns. Later on, if you wish to switch
to ACECALC's 70-column display, or if you have
an 80-column display board, you may do so.

5.7   The Current Cell Marker

You can enter information into only one cell of the worksheet at a time. This cell is called the *current cell*. The current cell is marked by a white rectangle called the *current cell marker* (or simply the marker, which you should now see on on your screen at coordinate A1. The coordinate of the current cell (in this case, A1) is always displayed in the *current cell indicator* on the contents line, in the top-left corner of the screen.

6. BEEP!

Everybody makes mistakes. Sooner or later, as you use ACECALC, you'll make some kind of procedural error, and the computer will "beep" at you. That's a signal that whatever you've just typed doesn't make sense to ACECALC. In most cases you can correct the error simply by trying again. If this causes another beep, go back and reread the instructions for whatever you were trying to do, see what you did wrong, then do it again the right way.

Similarly, you may from time to time make typing errors while entering information. That kind of error is easy to fix: see the sections of this manual titled CORRECTING TYPING ERRORS and EDITING A CELL for details.

7. MOVING THE MARKER

Before you can enter information into a cell, you have to make that cell the current cell by moving the marker.

The marker can be moved in two ways: with the arrow keys, and with combination keystroke *control keys*. Let's look at the arrow key technique.

Press the right arrow key (on the right hand side of the keyboard). The marker should move to the right one space. Notice that the direction indicator is a dash (−), indicating horizontal movement.

The current cell indicator should now show B1 (because you've moved the marker).

Now press the space bar once. Notice that the direction indicator changes from a dash (−) to an exclamation point (!). This indicates that your movement direction is vertical now.

Press the right arrow key, and the marker will move down one cell to B2. Notice how the current cell indicator changes to reflect this move.

Press the space bar, then the left arrow key, and you will move the marker to A2.

Press the space bar, then the left arrow key, and you will move the marker back to A1 − right where you began.

If you now hit the left arrow key again, you'll hear a low-pitched tone, called a "thump". This is a signal that you've "bumped into the edge" of the worksheet and can go no further in that direction. Notice that the marker doesn't move and the current cell (A1) doesn't change.

The alternate method of moving the marker is to use combination keystrokes. These keystrokes allow you four direction motion within the worksheet without having to press the space bar, and there are several special options available. Here are the keys:

Ctrl-Q   Move the marker up one.

Ctrl-A   Move the marker left one.

Ctrl-S   Move the marker right one.

Ctrl-Z   Move the marker down one.

In order to activate one of these sequences, you must hold down the key marked Ctrl while simultaneously depressing the named letter.

The additional options are:

Ctrl-W   Move the marker up half a screen.

Ctrl-X   Move the marker down half a screen.

Ctrl-E   Move the marker to the beginning of the worksheet.

Ctrl-C   Move the marker to the end of the worksheet.

These marker control options are very useful in getting around in the worksheet quickly.

8. SLIDING THE WINDOW

The electronic worksheet is actually much bigger than your screen. Make certain the direction indicator is a dash (horizontal movement). Press the right arrow key four times, to move the marker to cell E1 at the right edge of the screen. Now press the right arrow once more, and watch the row of column letters across the top of the worksheet window. The letters will shift one column to the left, with A disappearing at the left end and E appearing at the right. The worksheet window has *slid* one column to the right on the worksheet, pushing column A out of view and revealing column F which wasn't visible before.

If you continue to press the right arrow key, the window will continue to slide to the right over the worksheet, bringing new columns into view. You can think of the marker as dragging the edge of the window along as it moves across the worksheet. Try pressing the left arrow five times to move the marker back to the left, and you'll see the window slide to the left along with it. You can also slide the window up or down in the same way (if the direction indicator is vertical).

9. HOW BIG IS THE WORKSHEET?

Now start pressing the right arrow key repeatedly, to move the marker and the window to the right again. Keep going until you reach the end of the alphabet. When you pass column Z, columns AA, AB, AC will appear.

By this time you're probably getting tired of pressing the right arrow key. Try holding down the right arrow for a second. Holding down any key causes that key to be repeated over and over again, at high speed. So in this case it sends a whole string of right arrows, for as long as you hold down the key. This feature is particularly useful for long-range marker moves such as you're doing now. Continue to hold down Right Arrow until you start hearing "thumps" signaling that you're bumping into the right edge of the worksheet. After column AZ comes BA, BB, and so on. When you reach the edge of the worksheet, you will see that the last column is BK. Since K is the eleventh letter of the alphabet, this means that there are 26 + 26 + 11 = 63 columns altogether.

Now set the marker direction to vertical (by pressing the space bar). Press and hold down Right Arrow to move the marker repeatedly downward, and watch the column of row numbers at the left edge of the screen. When the marker reaches the bottom of the screen, the window will begin to slide downward over the worksheet, with old rows disappearing at the top and new rows coming into view at the bottom. Keep on holding down Right Arrow until you bump into the bottom edge of the worksheet. It takes quite a while, doesn't it? When you finally reach the bottom, you'll find that the last row on the worksheet is row 254. So altogether the worksheet contains 254 rows times 63 columns, or 16,002 cells. The current cell indicator at the beginning of the contents line should now read BK254, the cell in the bottom-right corner of the worksheet.

Note: In 80-column mode, and sometimes in 40-column mode, the screen will not be able to keep up with repeating sequences. This does *not* mean that ACECALC is ignoring you. On the contrary, it will be updating its marker location internally, and will always update the uppermost row number (for vertical marker moves), and the leftmost column number (for horizontal marker moves).

10. JUMPING DIRECTLY TO A CELL

Now that you have the marker in the bottom-right cor-
ner of the worksheet, how can you move it back to the
top-left, where you started? You could go back the
same way you came, using Left Arrow to slide the win-
dow up the worksheet, then pressing the space bar
and continuing with Left Arrow to slide it to the left.
But there's a quicker way to move the marker directly
to any cell you wish. To jump directly to a cell while at
command level:

1. Type the character > (hold down the SHIFT key and
   type a period.

The character > stands for the Go To command. The
prompt message:

GOTO: COORD

will appear on the prompt line, and a small, blinking
white box (or underline) will appear on the entry line.
This blinking box is called the *edit cursor* (or simply
the *cursor*) and means that ACECALC is waiting for
you to type something in on the entry line — in this
case, the coordinate of the cell you wish to jump to.

2. Type the coordinate of the cell you wish to jump to.

Since you want to jump back to the top-left corner of
the worksheet, type the coordinate A1. Notice that as
you type each character, it appears on the entry line
and the cursor moves one position to the right to show
where the next character will go. If you make a typing
error, you can correct it as long as the cursor is still
visible on the entry line — see CORRECTING TYPING
ERRORS.

3. When the coordinate on the entry line is correct,
   press the RETURN key to complete the Go To com-
   mand. The marker will immediately jump to the re-
   quested coordinate, which will also appear in the
   current cell indicator at the top of the screen, and
   you will be back in calculate mode.

11. SUMMARY OF MARKER MOVEMENTS

You have now learned four ways to move the marker from one place to another on the worksheet:

- With the right and left arrow keys, using the space bar to switch from horizontal to vertical movement.
- With the Ctrl — Q, Ctrl — A, Ctrl — S, and Ctrl — Z keys.
- With Right Arrow, and Left Arrow for rapid marker movements.
- Use the Go To command (type the character >) to jump directly to any desired cell.

Take a few minutes to practice these four different ways of moving the marker. Before long, you'll be able to move quickly to any cell you wish.

12. INFORMATION AND THE WORKSHEET

Now you're ready to start entering information into the worksheet. Each individual cell of the worksheet can hold one single item of information, which may be either:

- A *value:* a number, or a formula telling how to calculate a number.
- A piece of *text:* a sequence of characters (letters, digits, spaces, punctuation, and so forth), not necessarily intended to represent a number or a formula.
- A *repeating label:* a pattern of characters that are to be repeated as many times as necessary to fill the cell.

You'll learn about each of these different types of information in the sections that follow.

A cell can hold no more than one item of information at a time. When you enter new information into a cell, it replaces any previous information the cell may have contained. It's a little like recording music on magnetic recording tape: the previous contents are permanently erased and cannot be recovered.

13. ENTERING TEXT INTO A CELL

Let's begin building the demonstration model shown in Figure 1. The first thing we will want to enter is a set of column labels so we can keep our entries straight.

The first column title begins in cell A4, so move the marker to A4 using any of the methods described listed under SUMMARY OF MARKER MOVEMENTS.

Now, simply type the word:

TASK

As you type the first character, three things happen:

The word LABEL will appear in the prompt line.

The character "T" will appear on the entry line.

The character "T" will appear in cell A4 in the marker.

As you continue to type characters, the letters continue to appear on the entry line, the blinking cursor moves to the right, and the letters appear inside the marker in cell A4.

To terminate the entry of this label, simply press RETURN, or one of the keys that move the marker. The entry will then be accepted, and become part of your worksheet. Until you press one of these keys, the entry is available to be *edited*; that is, it is not yet permanent.

For the purposes of this example, terminate the input with a Ctrl-S, or a right arrow key (if the *marker direction* is horizontal, as shown by a dash in the direction indicator square).

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Now, type the labels:

HOURS in cell B4
RATE in cell C4
COST in cell D4

just as you typed TASK.

You should now have all your column labels set up! That was easy, wasn't it?

Why not take off on your own for a moment and type in the row labels. Use the Ctrl-Z keystroke to enter these labels:

RESEARCH   in A5
FIRST PASS   in A6
EDITING   in A7
REWRITING   in A8
TYPESETTING in A9
PRINTING   in A10
TOTAL   in A11

If you are watching carefully, you will notice something strange happening when you enter the word RESEARCH. The entire word appears on the entry line, but in cell A6, where the marker is located, the word RESEARC appears.

ACECALC remembers the entire label you type, but it displays only the number of letters it can fit in the column.

The worksheet display that we now have is not quite what we want, but that is where one of the most powerful features of ACECALC comes into play: variable column width.

In many cases the row titles have to be longer than the amount of space required to display the numbers. It would be a shame, not to mention a waste of space, to set all the columns to a width large enough to accommodate the titles.

14. SETTING INDIVIDUAL COLUMN WIDTH

In order to set the column width, you must have positioned the marker in that column. Position the marker in column A, if it is not already there using any of the marker movement commands discussed earlier.

Now type:

/

Do not hit a RETURN. You should see a new display on the prompt line:

/: A B C D E F G I L M P R S T W —

The slash (/) character signals ACECALC that you are going to enter a command. What you see on the prompt line is the entire list of commands available at that point.

Now type the letter L (again no RETURN key is necessary). The prompt line will change to read:

COLUMN WIDTH: 0 — 36 D

The longest title we wish to display is TYPESETTING, which is eleven letters long, so type 11, and press the RETURN key to enter the new column width. Notice how column A expands to eleven spaces, pushing all the other columns over. ACECALC now can display all of your row titles in their entirety!

15. ENTERING A VALUE INTO A CELL

Now, let's enter the values for the hours.

Entry of values is much the same as entry of labels.

1. Move the marker to the desired cell (in this case B5).
2. Type the number you wish to enter.

Type the number 65. Just as before, what you type will appear on the entry line, with the cursor advancing a character at a time as you type. As long as the cursor is still visible on the entry line, you can edit what you've typed to correct errors, or cancel the entire entry and restore the cell to its previous contents (see CORRECTING TYPING ERRORS, which follows).

4. When the information on the entry line is correct, press the RETURN key to enter the information into the current cell.

When you press RETURN, the contents of the entry line (65) will be transferred to the current cell (B5), replacing any information the cell may have contained previously. The entry line will be cleared, the edit cursor will disappear, and you will be returned to calculate mode.

There is no way to recover what you had in a cell after you have entered new data by pressing the RETURN or marker movement keys, so be sure you are not over-writing valuable data before pressing RETURN (or one of the marker movement keys).

Notice that the contents line (the top line of the screen) has changed to read:

B5   V:65

This line always shows you the contents of the current cell. In this case, B5 is the coordinate of the current cell; the V: means that the cell contains a numerical *value;* and 65 is the value the cell contains.

Now enter the values for the rest of the items as follows (remember to terminate each entry with a RETURN or a Ctrl-Z):

FIRST PASS   **112**
EDITING   **56**
REWRITING   **68**
TYPESETTING   **52**

Do not enter anything for PRINTING.

16. CORRECTING TYPING ERRORS

If you make a mistake while typing something on the entry line, all is not lost. Recall that the entry line is only a temporary storage area — the information you type there doesn't become final until you *enter* it into the worksheet, by pressing the RETURN or marker movement keys. As long as you have not pressed one of these keys, you can modify the entry or back out entirely.

The simplest way to correct a typing error is to just back over the letters you typed in error, then retype the correct ones. This is where the special key marked ESC (for ESCape) comes into play.

The ESC key is your backspace key. It also deletes the characters it backs over, allowing you to enter them again correctly.

Note: Using the ESC key to back the cursor all the way out of the beginning of the entry line will cancel the entire entry and return you to calculate mode.

Let's enter the first word of the title: PROGRAM DOCUMENTATION PLANNING MODEL, and get some practice using the ESC key to correct typographical errors.

First, move the marker to cell B1. Now, type:

PRAGRAM

Do not press the RETURN or marker movement keys. You will notice that there is an error in the spelling. In order to correct this, press the ESC key. Notice how the M disappears, and the blinking cursor moves one space over to the left.

Continue pressing the ESC key until you have erased all the characters except the PR (press the ESC key four more times).

Now, type:

OGRAM

Since what you now see on the entry line is correct, you may press the RETURN or marker movement keys to enter it.

17. IMMEDIATE CALCULATIONS

Now, let's enter the values for rates. Say the employees doing the bulk of the work — research, first pass, editing, and rewriting are making $18.00 per hour, plus fringe benefits and office space considerations amounting to roughly 36% of their hourly salary. We can express the effective rate as 18.00 times 1.36.

Move the marker to cell C5, using any of the marker movement keys, and type the formula:

18*1.36

Note: The asterisk (*) is ACECALC's multiplication symbol.

As when you entered the values for hours, the prompt line will immediately display the word VALUE.

If you were to press RETURN or a marker movement key, the formula would be entered as is, and the result of the formula would be placed in cell C5. This is not always desirable, as ACECALC has to reevaluate *all* formulas every time it recalculates the worksheet. Since this number is relatively constant, and has no dependencies on other cells, we can use *immediate calculation* to replace our formula on the entry line with the actual result.

Press the exclamation point (!), and the formula on the entry line will be replaced with 24.48. Now you may press RETURN or one of the marker movement keys to enter the data.

Now enter the rest of the values for rate, either by typing them in directly, or by using the immediate calculation feature.

18. HINTS ON ENTERING TITLES

Entering titles into ACECALC is a very simple task, and will help you identify the nature of the data in your various worksheets.

Using the title we began to enter in the previous section, we now have the partial title:

PROGRAM

Notice that the word PROGRAM completely fills cell B1. We know from previous experience that if we were to continue typing, the entry would be remembered, but only the amount that fit in the column would be displayed.

This time, we will move over to the next column to continue the title, as expanding the column width would interfere with the columns of numbers below.

Move the marker over to cell C1. Note that the continuation of the title must begin with a space. We know that simply typing a space signifies to ACECALC that we wish to change the marker movement direction.

In order to start a label with a space, a number, or any character that has special significance to ACECALC, we must first type a quote mark ("). To enter the continuation of our title, type the quote mark now.

The word LABEL should now appear on the prompt line.

Now type a space, then the next word, DOCUMENTA-TION, watching what happens as you type each letter.

When you reach the first N in DOCUMENTATION, you run out of room in the cell. You can tell this by watching the letters as they appear in the cell. This is a signal to you that it is time to move to the next cell.

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Using the ESC key, back up over the N, then enter the word DOCUME (with a space at the beginning) by pressing RETURN or one of the marker movement keys.

Move the marker to cell D1 if it is not already there, and complete the first title line by typing:

NTATION.

Now, move the marker to cell B2 and enter the title:

PLANNING MODEL

the same way as you entered the previous line.

19. INSERTING AND DELETING ROWS AND COLUMNS

We forgot to put in rows for the dashed lines. It would be a shame if we had to re-key all of our work just to rectify so small an error. We all change our minds about what we want to put in planning models, so ACECALC has a facility for inserting and deleting rows and columns.

To insert a row in the worksheet:

1. Move the marker to the row below where the new row is to go.

In this case, since you're adding a new row above RESEARCH, you want the marker positioned in row 5.

2. Type the slash (/) key. You will recall that this key signals ACECALC that you are about to enter a command.

The prompt line will now read:

/: A B C D E F G I L M P R S T W —

Indicating your possible choices.

3. Press the I key, indicating that you want to insert.

The prompt line will display the message

INSERT: R(−) C(!)

asking whether you wish to insert a row or a column. It might seem trivial, but it is not apparent to some people which are rows and which are columns. That is why the (−) and (!) are included in the prompt. Rows are horizontal (−), and columns are vertical (!). You should be familiar with this convention from the marker direction indicator.

4. Type R (for Row).

A new, empty row will appear at the marker position; the row containing the marker, and everything below it, will be shifted down one place to make room, and you will be returned to the calculate mode.

Note: In the future, we will not spell out the commands in such detail — we will simply say, for example:

Type /IR to insert a row. This stands for:

- command
- insert
- row

Now, type /IR (Insert Row) five more times, so that you have six blank rows between TASK and RESEARCH. Note how the row containing the word RESEARCH moves down each time.

Inserting a column in the worksheet is virtually the same. Simply follow this procedure:

1. Move the marker to the column where the new column is to go.
2. Type /I (for Insert).

As before, the prompt line will display the message

INSERT: R(—) C(!)

asking whether you wish to insert a row or a column.

3. Type C (for Column).

A new, empty column will appear at the marker position; the column containing the marker, and everything to the right of it, will be shifted one place to the right to make room; and you will be returned to calculate mode.

It's just as easy to delete a row or a column from the worksheet as it is to add one. Let's delete one of the extra rows you just added at the top of the worksheet.

To delete a row or column from the worksheet:

1. Move the marker to the row or column you wish to delete.

For now, place the marker in row 5.

2. Now type /D (for delete).

The prompt line will display the message

DELETE: R(−) C(!)

asking whether you wish to delete a row or a column.

CAUTION: Although in this case you're only deleting an empty row, it's just as easy to delete a row or column full of information. Once you type R or C, the contents of the row or column the marker is in will be permanently erased from the worksheet — you will not be able to get them back. Make sure you have the marker in the right place! If you don't, or if you change your mind about deleting the row or column, or have typed D by mistake, you can cancel the Delete command by pressing any key except R or C.

3. Type R (for Row), or C (for Column).

In this case, since you really do mean to delete the row containing the marker, type R. Row 5 will disappear from the worksheet; everything below it will be shifted up one place to close up the space.

Type /DR three more times to delete the excess space and leave room for the row of dashes.

Now, following the procedure you have just learned, insert a blank row for the dashes between PRINTING and TOTAL.

20. BLANKING OUT A CELL

Let's assume you have made a grievous mistake and entered some data in a cell you actually wanted to leave blank. You have the choices of entering a blank label, or simply telling ACECALC to blank out the cell. The latter method is preferable.

To blank out the contents of a cell of the worksheet:

1. Move the marker to the desired cell.

For this example, move the marker to any cell that has something in it.

2. Type /B (for Blank)

The message

BLANK

will appear on the prompt line. You must press a RETURN or marker movement key to confirm this operation. The ESC key will back you out of it. This extra *confirmation* step protects you from accidentally destroying the information on your worksheet. ACECALC is asking, "Are you sure you want to blank out the current cell?"

CAUTION: When you press RETURN, the contents of the current cell will be permanently erased from the worksheet — you will not be able to get them back. Be sure this is really what you want to do! If you change your mind about blanking out the cell, or have typed /B by mistake, you can still cancel the Blank command by pressing the ESC key.

3. Press the RETURN key to complete the Blank command and return to the calculate mode.

The contents of the cell will disappear from your screen, and you will be back in calculate mode.

Note: It isn't necessary to blank out a cell in order to store something new into it. Just entering new information into a cell automatically erases any previous information the cell may have contained.

21. EDITING A CELL

Once labels and values have been entered into cells, you may recall this data for *editing*.

Assume you looked at your worksheet and decided FIRST PASS really would look better if it read PASS ONE.

To edit the contents of a cell:

Move the marker to the cell you wish to edit.

In this case, move to cell A7, the cell in which FIRST PASS appears.

2. Type /E (for Edit).

The contents of the current cell,

FIRST PASS

will appear on the entry line, with the cursor over the first character. The prompt line will change to read:

EDIT A LABEL

since that's the kind of information the cell contains.

3. Edit the contents of the entry line.

The first thing you want to do is delete the letters:

FIRST

The right and left arrow keys allow you to move the cursor back and forth on the entry line. Position the cursor so it follows the first character to be deleted — in this case, the space following the word FIRST.

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Now use the ESC key to back up over the space, and the word FIRST.

If you try to back up past the beginning of the line, you will hear the familiar "thump", indicating that you have bumped into the end of the data.

Notice the difference between the action of the arrow keys and the ESC key in edit mode:

Arrow keys are *non-destructive* cursor movement keys.

The ESC key is a *destructive* backspace key.

Now, using the right arrow key, move the cursor to the end of the word PASS (which is all that is left on the entry line).

If you move the cursor past the end of the data on the line, you will again hear a "thump", indicating that you have bumped up against the end of the data. The cursor will remain in the position after the last character if you were moving right, or on the first character if you were moving left.

Type a space, then the word ONE. Now, when you press RETURN to accept the edited entry, the label will read PASS ONE.

Note: There is no "escape" from an edit, so if you delete any characters, do so with care, as a deleted character is permanently lost.

Let's assume that after looking at the display you decide that FIRST PASS looked better after all.

Position the marker over cell A7 and type /E (edit a cell).

Again the message:

EDIT A LABEL

will appear on the prompt line. The first thing we want to do is remove the space, and the word PASS, so we will use a new editing key: Ctrl-T. Ctrl-T *truncates* the text on the entry line at the cursor position — that is it deletes all characters from the cursor position to the right end.

Using the right arrow key, position the cursor over the space between PASS and ONE. Now, press Ctrl-T (hold down the Ctrl key, and simultaneously depress the T key).

The space and the word ONE are instantly gone! Now for the exciting part:

Move the cursor back to the first character on the line (in this case, the P in PASS). Now type:

FIRST

and don't forget the space. Did you see how each character you typed pushed all the others to the right?

Of course, you must press a RETURN to enter the modified text:

Note: You may enter edit mode from text or value entry mode simply by typing Ctrl-E. Remember, however, that Ctrl-E is a marker movement key also, so in some cases it makes more sense to ACECALC to move the marker (as you will see later) than to enter edit mode.

22. ENTERING A REPEATING LABEL

How about underlining those column headings, to make them look more professional? You can underline each heading by filling the cell below it with dashes. The easiest way to do this is with a *repeating label:* a pattern of one or more characters that will be repeated as many times as necessary to fill up a cell on the screen.

To enter a repeating label into a cell of the worksheet:

1. Move the marker to the desired cell.

The first underline goes in cell A5, so move the marker there.

2. Now, type / —

The dash stands for the Repeating Label command. The prompt line will display the words REPEAT LABEL. ACECALC is prompting you to type your repeating label. Whatever you now type on the entry line will be repeated as many times as necessary to fill up the current cell (regardless of the column width!).

3. Type the repeating label.

Since you want to fill cell A5 with dashes, type another dash. The first dash you typed (step 2) was a command to ACECALC, the Repeating Label command. This second dash (step 3) is the actual repeating label itself. (This particular repeating label happens to be just one character long, but you can type one of any length you wish.)

As usual, you can edit the contents of the entry line or back out of the repeating label operation using the ESC key, or the Ctrl-E edit command until until you press RETURN or a marker movement key.

4. When the repeating label is correct on the entry line, press RETURN or a marker movement key to enter it into the current cell and return to calculate mode.

Cell A5 will fill up with dashes, as advertised! Notice that the contents line at the top of the screen now reads:

A5   **/ — L: —**

The / — means that the cell contains a repeating label; the L: means that what follows is the repeating label and the dash after the L: is the actual repeating label itself.

You may be wondering why you couldn't just type in enough dashes to fill up the cell, instead of using a repeating label. One good reason is simply that it's easier to type just one dash and let ACECALC do the repeating. (That's what computers are for — to do repetitive tasks for you.) But there's an even better reason: if you just type in the dashes and later decide to change the width of the column, you'll suddenly find that you have the wrong number of dashes in cell A5. When you use a repeating label, ACECALC will always fill up the cell automatically with the right number of dashes, no matter how wide you make the column.

23.   REPRODUCING A CELL

To underline the three remaining column headings, you could repeat the procedure you've just learned in cells B5, C5, and D5. But (as usual) there is an easier way: you can *reproduce* (just a ten-dollar word for "copy") the contents of cell A5 into cells B5 through D5.

To reproduce the contents of one or more cells into one or more other cells,

1. Type /R (for Reproduce).

The prompt line will display the message

REPRO: (, SOURCE RANGE OR RETURN

and the coordinate of the current cell (A5) will appear on the entry line, followed by the cursor. ACECALC is prompting you to specify on the entry line the cell you wish to reproduce (the *source*) and where you want to reproduce it to (the *destination*), separated by a colon.

2. Edit the entry line, if necessary, to contain the correct source coordinate(s) (those of the cell or cells you wish to reproduce).

You're only reproducing a single cell this time, so the source will consist of just one coordinate. (In the next section you'll learn how to reproduce more than one cell at a time.) For convenience, ACECALC assumes that the current cell is the one you're most likely to want to reproduce, so it automatically fills in the coordinate of that cell on the entry line.

In this case, since the current cell is in fact the cell you wish to reproduce, no editing is necessary — just go on to step 3. If you wanted to reproduce some other cell instead, you could correct the coordinate on the entry line just as if you were correcting a typing error.

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Note: You will always get the right source coordinate filled in for you automatically if you begin by moving the marker to the cell you wish to reproduce, before typing /R (step 1 above). However, if the cell you are reproducing is some distance away from the marker, you may find it easier not to move the marker, but to edit the source coordinate on the entry line instead. Use whichever method seems more convenient in any particular case.

3. When the entry line contains the correct source coordinate(s), type a colon (:) to separate the source from the destination.

4. Supply the destination coordinate(s) (those of the cell or cells you wish to reproduce into) on the entry line.

For now, just type:

B5.D5

from the keyboard.

Notice when you type the period, ACECALC expands it into three periods. This is because three periods is the standard notation for ellipsis, or specification of a series by beginning and ending location.

In the next section you'll learn another way of specifying coordinates that is often more convenient.

The entry line should now read

A5:B5...D5

The part before the colon (A5) is the source of the reproduction; the part after the colon (B5...D5) is the destination. A destination of this form, consisting of two coordinates separated by three periods (note: you never have to type the other two periods), is called a range, and means that you want to reproduce the source (A5) into every cell from B5 through D5.

5. When the entry line contains the correct source and destination coordinates, press the RETURN key to complete the Reproduce command and return to command level. The repeating label you entered earlier in cell A5 will be copied (reproduced) into cells B5 through D5, and you'll be back in calculate mode again.

Again, you may be thinking that it would have been easier just to enter the repeating label into each of the cells separately. Well, it might (or might not) have been easier in our tiny example, but what if you had 48 monthly columns to underline instead of four annual ones? One Reproduce command is a lot quicker than filling in 48 cells, one at a time!

24. POINTING WITH THE MARKER

You're going to need another row of dashes to separate the figures for the various tasks from the totals on the "bottom line". In fact, you've already made room for them in row 12 of the worksheet.

You can use the Reproduce command again to copy the row of dashes from row 5 to row 12. But this time, instead of reproducing just one cell, you'll learn how to reproduce a whole *range* of cells at once. And instead of typing the source and destination coordinates from the keyboard, you'll learn how to *point* at the desired cells by moving the marker, letting ACECALC copy the coordinates to the entry line for you.

You're going to reproduce cells A5 through D5 into cells A12 through D12. Just as you did in the preceding section, begin the Reproduce command by typing /R. As before, the message:

REPRO: (, SOURCE RANGE OR RETURN

will appear on the prompt line and the coordinate of the current cell (A5) will automatically be copied to the entry line, followed by the edit cursor. The *source range* is the cell, or range of cells you wish to reproduce.

This time, instead of just the single cell A5, the source of the reproduction will be the *range* of cells from A5 to D5. You can specify a source range the same way you specified the destination range last time, by giving the coordinates of the first and last cells in the range, separated by a period. Since the first cell in the range is the current cell (A5), its coordinate has already been filled in on the entry line. Instead of typing the "..." separator (this is the ACECALC notation for a range), we're simply going to let ACECALC fill it in for us. This time, instead of typing in coordinate D5, you're going to *point* at cell D5 with the marker, and let ACECALC fill in the coordinate for you automatically.

To specify a coordinate by pointing with the marker simply use any of the marker movement keys (right and left arrow keys, Ctrl- Q, Ctrl-A, Ctrl-S, Ctrl-Z, Ctrl-W, Ctrl-X, Ctrl-R, and Ctrl-C) to move the marker to the cell.

As soon as you press one of the marker movement keys, ACECALC fills in the "..." separator, and copies the coordinate of the cell upon which the marker is resting onto the entry line as the last cell in the range.

You may use the space bar to switch the marker movement direction at any time during this process.

As you continue to move the marker, the cell coordinate displayed on the entry line changes. Type Ctrl — S three times to move the marker three cells to the right, to the last cell in the range you wish to reproduce (D5).

3. Now you must supply the punctuation character that is to follow the coordinate on the entry line. In this case it is a colon (:).

A *punctuation character* is a character used as a separator (much the same as punctuation characters are used as separators in the English language). In ACECALC, you will be using the colon (:) as the punctuation character that separates the source range from the destination range in the Reproduce command, and the period (.) as the punctuation character that separates the beginning and ending cells in each of these ranges.

Other punctuation characters are used in ACECALC, but they are better thought of as *arithmetic operators* ($+$, $-$, $/$, $*$), or *relational operators* ($<$,$>$, $=$, $<=$, $>=$). We will go into the uses of some of the arithmetic operators later in the Tutorial. All the operators will be covered in the Reference Guide.

Once the punctuation character is typed, ACECALC will display the message:

REPRO: ENTER TARGET RANGE OR RETURN

on the prompt line. The *target range* is the cell or range of cells to which you want to reproduce your source cell(s).

ACECALC will try to prevent you from making obvious errors. For example, if you had typed:

B1...E1

on the entry line, and then tried to enter a letter, rather than a colon, ACECALC would beep at you, then wait for you to make an acceptable entry. Some errors are impossible for ACECALC to detect, for example, if you had typed a 0, rather than a colon, ACECALC would assume you meant to use coordinate E10. Fortunately, the ESC key will back up over mistakes of this nature.

Note: If you press the RETURN key instead of a punc-tuation character, ACECALC will insert a colon (:) and prompt you for the target range. You may make any corrections necessary using the ESC key simply by backing over the colon, and the er-roneous letters or numbers.

As shown on the prompt line, the source and destina-tion are to be separated on the entry line by a colon; so type a colon (:), if you haven't already done so. The marker will jump back to cell A5. The entry line should now read:

A5...D5:

Now you can supply the destination coordinate in the same way. Use the marker movement keys (either the arrow keys, or the Ctrl keys) to move the marker down to cell A12 (which is the first cell you wish to reproduce into.

Notice that as soon as you press one of the marker movement keys, the cell on which the marker is resting appears on the entry line immediately following the colon (:). By now, you should be getting the idea of pointing with the marker.

The entry line should now read:

A5...D5:A12

This means you want to reproduce the range of cells from A5 to D5 (the source) to locations *beginning* at A12 (the destination). Now press RETURN to complete the Reproduce command, and the row of dashes will be copied from cells A5 to D5 into A12 to D12.

Note: Notice that you didn't have to specify the entire destination range, just the first cell. When the source you specify is a range and the destination is only a single cell, the actual destination is understood to be a range of cells, with the same dimensions as the source, beginning at the requested destination coordinate.

You've now learned two different ways of specifying the coordinate of a cell: (1) by typing the coordinate directly from the keyboard, and (2) by moving the marker to point at the cell using any of the marker movement keys.

Now that you know both methods, you can use the one that's more convenient in any particular case. If you make a mistake at any point in this process, you are free to use the ESC key to backspace over the error, then either retype the correct information, or point with the marker.

Just for practice, use the Reproduce command to copy the rate from C6 to cells C7 through C9.

Now enter the rate for TYPESETTING in cell C10 just by entering the value 19.

25. INITIALIZING A DISKETTE

By now you've done quite a bit of work on the demonstration model — it would be a pity if the lights went out and you had to reconstruct it all from scratch. It's a good idea to save the contents of your worksheet frequently on a floppy diskette, as insurance against disaster. Then, if someone should happen to trip over your Ace's power cord, you can back up to the last version of the worksheet you saved, losing only the work you've done since then. Accidents do happen — don't "play for more than you can afford to lose"!

Before you can store any information on a diskette, you first have to initialize the diskette. Once the diskette has been initialized, you can add more information to it whenever you wish. So there's no need to initialize a diskette every time you want to save your worksheet — you only have to do it the first time you use a particular diskette.

Take a blank diskette and write something descriptive on the label, such as "ACECALC Storage Diskette" and the date.

CAUTION: Never use anything but a felt-tip pen to label a diskette, and don't press down too hard, to avoid damaging the surface of the diskette inside its black jacket. If you're using a gummed label that isn't already attached, it's safest to write on the label *before* attaching it to the diskette.

Note: Always label a diskette the first time you store anything on it, so the next time you pick it up you'll know what it contains.

To initialize a diskette:

1. Place the diskette you wish to initialize in one of your disk drives.

Open the door to any disk drive and carefully insert the diskette you just labeled, with the label nearest you and facing up. (If you hold the diskette with your thumb on the label, you will have it facing properly.) Push the disk gently into the disk drive as far as it will go, then gently close the disk drive door.

2. Type /S (for Storage).
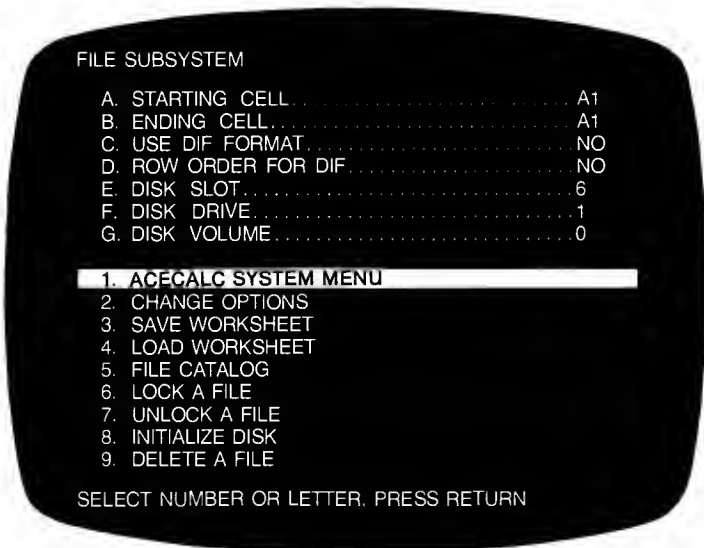
The prompt line will change to read:

ENTER LOWER RIGHT OR RETURN

You will only need to enter a lower right coordinate if you are using DIF files (DIF files will be covered in the Reference Guide), and do not wish to save the entire worksheet.

Press the RETURN key.

The following menu will be displayed:

```
FILE SUBSYSTEM

      A. STARTING CELL........................A1
      B. ENDING CELL..........................A1
      C. USE DIF FORMAT.......................NO
      D. ROW ORDER FOR DIF....................NO
      E. DISK SLOT............................6
      F. DISK DRIVE...........................1
      G. DISK VOLUME..........................0

      1. ACECALC SYSTEM MENU
      2. CHANGE OPTIONS
      3. SAVE WORKSHEET
      4. LOAD WORKSHEET
      5. FILE CATALOG
      6. LOCK A FILE
      7. UNLOCK A FILE
      8. INITIALIZE DISK
      9. DELETE A FILE

  SELECT NUMBER OR LETTER. PRESS RETURN
```

Note: If you press the ESC key twice, it will back you out of the Storage command, and return you to the calculate mode.

3. Make sure the Disk Slot (option E) and Disk Drive (option F) correspond to the disk drive in which you placed your blank diskette.

Slot and drive numbers are explained in the Ace Disk Operating System (DOS) Manual that came with your disk drives. If you only have one disk drive, you don't need to worry about slot and drive numbers: ACECALC will set them for you automatically. So you can skip this step and just go on to step 4.

If you have more than one disk drive, you must make sure the slot and drive numbers on the prompt line correctly identify the drive the diskette is in. Whenever you start up ACECALC, the slot and drive numbers are automatically set to those of the main disk drive (the one you used to start up the system). So if you placed the blank diskette in that drive, the slot and drive numbers are guaranteed to be correct, and you can go on to step 4. If you are using a different disk drive, you have to change the slot and drive numbers to the correct ones before going on.

To change any of the options, you may move the highlight bar (which should be resting on ACECALC SYSTEM MENU) either by using the right and left arrow keys, or by typing the number of the menu item you wish to select.

In order to actually make a selection, you must first move the highlight bar, as described above, then press the RETURN key, or repeat the number or letter of the option to confirm the selection.

For example, we could select item 4 — LOAD WORK-SHEET by pressing the arrow keys until the highlight bar was over item 4, then pressing the RETURN key; by typing 4, then pressing the RETURN key; or by typing 4 twice. To change the Disk Drive, type the letter F. The highlight bar will immediately jump to F. DISK DRIVE.

Now, press RETURN to confirm your selection.

At the bottom of the screen the following prompt will appear:

ENTER, (MIN = 1, MAX = 2);

Followed by a blinking cursor.

This prompt is telling you the acceptable values for this entry. ACECALC will beep and wait for reentry if you type any illegal characters or values.

If you simply press RETURN, the entry will remain unchanged.

ESC will always back up, just as in the calculate mode, so if you press ESC, the cursor will back over any entry, and when there is no more data to back over, you will see the highlight bar jump immediately to 1. ACECALC SYSTEM MENU.

Note: The ESC key will back you out of any menu operation, and if you keep pressing it, you will wind up in calculate mode.

You can change the slot number the same way, except you must select item E.

4. Move the highlight bar to item 8. INITIALIZE A DISKETTE using either the arrow keys, or by typing the number 8.

5. Press RETURN to confirm your selection.

   The message:

   INSERT DISK TO BE ERASED

   HIT<RETURN>TO CONTINUE

   <ESC>TO ABORT

   will be displayed on the screen.

   CAUTION: If you reinitialize a diskette that already has information stored on it, the diskette will be wiped clean and the information it previously contained will be permanently erased. Never initialize a diskette unless you're sure it doesn't contain useful information that you want to keep.

Since initializing a diskette will erase any previous information it contains, ACECALC is giving you a chance to "back out" safely, without destroying any information.

Note: If you change your mind or have made a mistake, you can now cancel (or "abort") the Initialize command by pressing the ESC key.

In this case, you really do want to initialize the diskette, so

6. Press the RETURN key.

The red light on the front of the disk drive will come on, and the disk drive will begin making its usual noises. After about 30 seconds the noises will stop, the light will go off, and you will be returned to the FILE SUBSYSTEM. The diskette is now initialized and ready to receive information.

Note: Remember, you don't need to initialize a fresh diskette every time you want to save your worksheet. Once a diskette has been initialized, you can always add more information to it. So the next time you save the worksheet you can just use the same diskette, without reinitializing it. (In fact, if you *do* reinitialize a diskette after storing information on it, all the information it contains will be permanently erased.)

Note: The diskette you have initialized is *not* like a normal Ace diskette as it does not contain the disk operating system on it. What this really means is that you cannot boot it.

Press the ESC key twice to return to calculator mode.

Note: It is always safe to use the ESC key to exit a menu — if you use the RETURN key, you may inadvertently select a menu item you had not intended to.

26. SAVING THE WORKSHEET

Now that you've initialized a diskette, you can save the contents of the worksheet on it.

To save the worksheet on a diskette:

1. Make sure the diskette you wish to use is in one of your disk drives.

ACECALC storage diskette that you've just initialized should still be in the disk drive, so just go on to step 2.

2. From calculator mode, type /S (for Storage), then RETURN.

Once again, your worksheet display will be replaced by the File Subsystem menu.

3. Make sure the Disk Slot and Disk Drive numbers on the menu are the correct ones for the disk drive you're using.

You've already set the slot and drive numbers (or had them set for you automatically) when you initialized the diskette in the preceding section. Since you haven't moved the diskette to a different drive, these settings should still be correct, so just go on to step 4.

4. Move the highlight bar to item 3. SAVE WORKSHEET, and press RETURN to confirm your selection.

Ordinarily, a list of files would be displayed on your screen. These files would be numbered for easier selection. Since you are using a freshly initialized diskette, there will be no file display this time.

At the bottom of your screen the prompt:

ENTER FILE NAME OR NUMBER, OR (RETURN)

will be displayed and the edit cursor will appear. ACECALC is prompting you to supply the name under which you wish to file this worksheet on the diskette (or the number of the file, if it is listed in the file catalog).

Note: The word *file* refers to a unit of information stored on a diskette, such as the contents of a worksheet. A diskette may contain any number of files, as long as their total length doesn't exceed the diskette's capacity of 143 kilobytes. Whenever you write a file on the diskette, you must give it a file name, so that you can find it later. A *file name* may consist of any sequence of characters you wish (including spaces and punctuation marks), provided that the first character is a letter of the alphabet.

5. Type the file name you wish to use.

Since this demonstration model does program documentation planning, let's file it under the name PROGRAM PLAN. Type the letters PROGRAM PLAN. What you type will appear on the entry line, followed by the edit cursor. This gives you a chance to edit the name using the ESC key to back up in case you make a typing error.

CAUTION: A diskette cannot contain two or more files with the same name. If there is already a file on the diskette with the same name you type now, that file's previous contents will be permanently erased and replaced with the current contents of the worksheet. You will be given no warning that you are about to destroy information on the diskette, and no opportunity to confirm your intentions. Make sure you don't use the same name as any file you want to keep!

You don't have to worry about the name you choose this time, since you've just initialized the diskette and you know it's empty. But be careful the *next* time you save a worksheet!

6. When the file name is correct, press the RETURN key to complete the Save command.

The red light on the front of the disk drive will come on, and the drive will whir for a few seconds. When the light goes off, a new catalog of the diskette will be displayed, with your new file on it.

Note: To interrupt a catalog at any time, press the ESC key. You will be spared the rest of the catalog listing.

The prompt:

(RETURN) TO CONTINUE

will appear at the bottom of your screen.

When you press RETURN, you will be returned to the File Subsystem menu.

Press RETURN twice to get back to the calculator mode.

27. STARTING A NEW WORKSHEET

Now that you've saved your model on the diskette, you need to know how to load it back in from the diskette to the worksheet. First let's start a new, empty worksheet, so you can see the information you saved reappear when you load it back in.

Note: It is necessary to clear the worksheet every time you load a diskette file unless you want to *overlay* the one that is currently in memory.

To start a new worksheet:

1. Type /C (for Clear).

The message:

CLEAR: TYPE Y TO ERASE EVERYTHING

will appear on the prompt line.

CAUTION: If you now type Y, a brand-new worksheet will be started, permanently erasing the worksheet's previous contents. Be sure this is really what you want to do! If you're going to need the current worksheet again, always be sure to save it on a diskette file before starting a new one, so it will be available to load back in later.

Because the effect of the Clear command is irreversible, ACECALC stops and asks whether you're sure this is what you want to do. This extra confirmation step protects you from accidentally *destroying* the information on your worksheet.

Note: If you change your mind about starting a new worksheet, or have typed /C by mistake, you can still cancel the Clear command by pressing any key except the letter Y.

Since you really do want to start a new worksheet this time,

2. Type Y (for Yes).

All the information on the worksheet will disappear and the marker will jump to the top-left corner (cell A1). You now have a fresh, empty worksheet to work with.

Notice that the width of column A is reset to 7, rather than remaining at the 11 we set it at on the previous worksheet. The reason for this is that all *new* worksheets begin with a set of modifiable defaults, and the default for column width is 7.

If you'd like to take a break and continue your lesson another time, now would be a good time to do it. Turn off your Ace 1000 and video monitor, remove ACECALC storage diskette that you've just created, and put it away in a safe place. When you're ready to resume your lesson, start up ACECALC again (using the procedure given under STARTING ACECALC at the beginning of this manual) and continue with the next section.

28. LOADING THE WORKSHEET

Now you can load the program documentation planning model back into the worksheet from the diskette file where you saved it.

CAUTION: Loading the worksheet from a diskette file permanently overwrites any previous information already on the worksheet. If the worksheet contains information you're going to need again later, always be sure to save the old worksheet on a diskette file before loading a new worksheet.

Note: When you load a worksheet over another one, the cells that are blank in the worksheet you load will still have the old data in them. This is why it is important to clear out the old data in most cases.

To load the worksheet from a diskette:

1. Make sure the diskette you wish to load from is in one of your disk drives.

If your ACECALC storage diskette isn't already in a disk drive, put it in one now.

2. Type /S (for Storage).

The message:

ENTER LOWER RIGHT OR RETURN

will appear on the prompt line.

Type RETURN to enter the File Subsystem.

3. Make sure the Disk Slot and Disk Drive numbers on the menu are the correct ones for the disk drive you're using.

If you have only one disk drive, just go on to step 4. If you have more than one drive, recheck the slot and drive numbers on the menu to verify that they correspond to the drive you're using. If you need to change the slot or drive number, refer back to INITIALIZING A DISKETTE for details on how to do it.

You've already used two of the File Subsystem options, Initialize and Save. Now you're going to use the Load option:

4. Move the highlight bar to item 4. LOAD WORKSHEET using the arrow keys, or by typing 4.

As before, you will have to press RETURN to confirm your choice. A catalog of the diskette will be displayed on your screen. Since you only have one file on the diskette, you will see the following display:

1. T PROGRAM PLAN

and at the bottom of the screen the prompt

ENTER FILE NAME OR NUMBER, OR (RETURN)

= = >

5. Type the file name or number of the worksheet you wish to load.

The file name you used earlier when you saved the worksheet was PROGRAM PLAN, so type that name back in now, or simply type the number 1. What you type will be displayed on the screen followed by the cursor, so you can edit the name if necessary to correct typing errors.

6. When the file name or number is correct on the entry line, press the RETURN key to complete the load command and return to File Subsystem menu.

Now press the RETURN key twice, and you will be back in calculate mode. The demonstration model will reappear on your screen, just as it was when you saved it on the diskette.

29. ENTERING A FORMULA

Now we come to ACECALC's most powerful feature of all, the one that makes it such a useful, versatile tool. Instead of putting a simple numerical value or a piece of text into a cell, you can enter a *formula* representing a calculation, which may be based on the contents of other cells. Then, whenever you change the contents of any of the cells the formula is based on, the value of the formula will be recalculated automatically to reflect the new data.

You're going to enter a formula in cell D6, then reproduce it to other cells in column D. We know that column D is the COST column, and we also know that COST = HOURS times RATE.

ACECALC uses the symbol * (asterisk) to stand for multiplication, so our formula might better be stated:

COST = B6*C6

We know where the cost cell is, so let's move the marker there now (cell D6).

Here's where the trick comes in: if you enter B6*C6, ACECALC will look at the first letter of the formula, and noting it is a letter, will assume you are entering a label. In order to let ACECALC know that you are entering a *formula*, enter:

+ B6*C6

64

Note: You may use the marker movement keys to point to the cell you want, just as you did when you were using the Reproduce command. The procedure for this is to type the plus sign to signify that a value will be entered, then begin moving the marker. As before, when the marker is moved, the cell coordinates that it passes over will be displayed on the entry line. When you have moved the marker to B6, you simply type the asterisk (*). The marker will jump back to D6. You may then either enter the coordinate C6 directly, or point to it with the marker.

Note: You are free at any time to use the ESC key to back up over incorrect entries. You may also "jump" into edit mode using the Ctrl – E key (see Editing a Cell).

To actually *enter* the formula, press the RETURN key or any of the marker movement keys.

Press the RETURN key now, and watch as your formula is calculated instantly on the screen.

Now, to demonstrate some of the power of ACECALC, assume the research phase of the project took only 59 hours. Move the marker to cell B6 and type 59.

As soon as you hit the RETURN key, not only is the current cell (B6) updated, but also all cells that rely on it for calculations. Look at cell D6 – the contents should reflect the new data for hours!

Move the marker to cell B6 and type 65.

30. TIME OUT FOR SOME HOUSEKEEPING . . .

This would be a good time to save your work again, so that if anything should go wrong you won't have to reconstruct the formulas you've just entered. If you've been following the instructions carefully, your ACECALC storage diskette should still be in the same disk drive you left it in when you loaded the worksheet from it earlier. Just as before, type /S (for Storage), then RETURN, in response to the message:

ENTER LOWER RIGHT OR (RETURN)

You will be presented with the File Subsystem menu (which you have learned to use in previous sections).

Select option 3 — SAVE WORKSHEET.

CAUTION: Remember, if you save the worksheet now under the same file name as last time, the new version of the file will replace the old one on the diskette, and the previous version will be permanently erased. Be careful not to destroy a file you may want again later!

You will again (as with all File Subsystem commands) get a catalog of the disk you have specified as your data diskette.

Ordinarily there would be no need to hang onto the old version of the model you're building, so you could just type the number of the file name that contained your model to save the new version under the same file name as before. Sometimes, however, you may have some special reason to want both the earlier and later versions of the .model available on the diskette at the same time. (For instance, you may be trying out some changes that you're not sure you want to keep permanently.) In cases such as these, you will want to specify a different file name.

Note: You may *not* select a new file by number — you will have to type the name in.

Let's save this worksheet under the name PROGRAM PLAN 1. To do this, simply type in PROGRAM PLAN 1 in response to the prompt.

The red light will come on, and the disk will spin for a while, then you will be shown a new catalog of the disk. This new catalog is provided to confirm to you that the operation you requested has indeed taken place.

Just to verify that the old and new versions of the PRO-GRAM PLAN model are both stored on the diskette, try loading the old version back in, then the new one again. From calculate mode, type:

/C

to clear the worksheet. You will be prompted:

CLEAR: TYPE Y TO ERASE EVERYTHING

Since you want to clear the worksheet, type Y.

Now type /S (for storage), and a RETURN to enter the file subsystem. Select option 4 — LOAD WORKSHEET.

You will be shown the familiar catalog of the diskette. There should only be two files on the diskette:

1. T PROGRAM PLAN
2. T PROGRAM PLAN 1

Notice the numbers to the left of the file names. These are the numbers referred to in the prompt:

ENTER FILE NAME OR NUMBER, OR (RETURN)

= = >

In order to load PROGRAM PLAN, simply type the number 1, and press the RETURN key.

Press the ESC or RETURN key twice to return to the calculate subsystem. Your worksheet should appear in-tact.

Now clear the worksheet as you did before, and load PROGRAM PLAN 1 by selecting number 2.

31. REPRODUCING FORMULAS

In order to fill up the cost column, we must reproduce the formula contained in cell D6 into the cells D7 through D10.

Reproducing a formula is much the same as reproducing a constant cell (a constant cell is one that does not depend on any other cells). Start by placing the marker in cell D6.

Now type:

/R

for reproduce. The message:

REPRO: (, SOURCE RANGE OR RETURN

will appear on the prompt line. Since you only want to reproduce the one cell, press the RETURN key. ACECALC will automatically insert the colon (:) punctuation character for you.

The message:

REPRO: ENTER TARGET RANGE OR RETURN

will appear on the prompt line. Notice that the contents line shows your formula:

+ B6*C6

Now fill in the target range just the same way as you did when reproducing a value — either by typing the coordinates directly, or by pointing with the marker. The finished entry line should read:

D6:D7...D10

As soon as you press RETURN to enter the Reproduce command, something new appears on the prompt line:

REPRODUCE: N = NO CHANGE, R = RELATIVE

and your entry line changes to read:

D6:D7.D10 + B6*C6

The blinking cursor will appear over the 6 in B6. What ACECALC is prompting you to do is specify whether the coordinate B6 in the original formula should be reproduced relative to the position of the location of the destination cell, or should remain B6 in all cases. For example:

If you specify R for relative, the formula in cell D7 will have the coordinate B6 (from the original formula) replaced with B7. Likewise, in D8, B6 will be replaced with B8, etc.

Sometimes, like when you are computing percentage of total, you will want one coordinate to remain the same, and other coordinates in the formula to vary.

For our case, we do want a relative reproduction of the formulas, so type the R key.

The cursor immediately jumps over to the 6 in C6. ACECALC will ask you the N = NO CHANGE, R = RELATIVE question for each coordinate in your formula.

We also want to reproduce the rate coordinates relatively, so type R.

Your formulas will all be reproduced, and the values will be filled in for all the cells.

To verify that the formulas were reproduced relative to their cell position, move the marker to cell D7.

The contents line should now read:

+ B7*C7

As you move the marker down the cells in column D, you will see that the reproduction of the formula did occur relative to the cell position.

Now, move the marker to cell D11 to enter the cost of printing (an outside cost so we don't have to get the hours or rate). This is a simple value, so all you have to do is type in the number.

32. USE OF FUNCTIONS

ACECALC provides us with a number of useful *functions* with which to manipulate our data. In this example, we are only going to look at one of those functions — the SUM function. All the functions are covered in detail in the Reference Guide.

Let's get a total for hours and for cost. You can probably figure out that the total for hours can be expressed as:

+ B6 + B7 + B8+ B9 + B10

This is rather clumsy, and at a certain point, you will almost certainly begin to create models that have columns of such length that such a method of notation is impossible.

Rather than adding each cell individually, we have the function @SUM (pronounced at-sum). Note the @ (commercial "at sign"). The @ informs ACECALC that you are entering a value, and that the value is to be derived from one of the built-in functions.

The best way to get the total hours is to move the marker to cell B13 and enter the following:

@SUM(

Notice that as soon as you strike the @ key, the prompt line changes to read:

VALUE

Most functions have *arguments*. An argument is a parameter that specifies to the function what cells to operate on, and in some cases, what the rules of the operation are.

@SUM requires a range of cells as an argument. This range will be summed, and any cell within the range not containing a numeric value will be disregarded.

You will recall, from the discussion on the Reproduce command, that a range of cells is specified as:

beginning...ending

So in our case the sum of the hours column is represented by the sum of the range B6...B11.

Once you have typed the left parenthesis, you may either specify the first cell in the range by typing the coordinate B6, or you can point with the marker, just as you did in the Reproduce command.

The entire formula you will be typing (or retrieving by pointing with the marker) is:

@SUM(B6...B11)

You may use the ESC key to edit information on the entry line until it is correct, then use any of the marker movement keys to enter it.

The total is immediately displayed in cell B13.

Now, using the same technique, place the total of the cost column (column D) in cell D13.

33. GLOBAL FORMATTING

Now we have all the numbers and titles in our model, but the formatting is just a little wrong. Wouldn't it be nicer if the rate and cost figures came out in dollars and cents?

We can set the format of the worksheet such that all numeric values display to two decimal places. This is called *global* formatting.

Type:

/G

The prompt line will change to read:

GLOBAL: C O R F A

As usual, the prompt line is reciting a list of your options. In our case, we want to use F for format.

As soon as you type the F, the prompt line changes to read:

FORMAT: D G I L R $ *

These various choices will be explored in depth in the reference manual. For now, simply type the dollar sign ($).

Immediately, two things will happen:

- The hours and rate columns will appear in dollars and cents format.
- Most of the cost column will fill up with less-than (<) characters.

33.1   What Is Overflow?

The reason your model now shows less-than signs in column D is that there is no longer enough room in column D to display the number with two trailing decimal digits. As a warning, ACECALC displays the less-than sign as an *overflow* symbol.

In order to fix this problem, simply move the marker over to column D and use the /L (column width) command as follows:

Type:

/L

When the COLUMN WIDTH prompt appears on the prompt line, type:

9

When you press the RETURN key, the column will have room to display all the digits required.

34. CELL FORMATTING

Since we are not counting hours to two decimal places, it would be better if we had left them as whole numbers. In computer talk, we call whole numbers *integers*.

Fortunately, ACECALC allows you to format each cell individually if the global format does not suit the type of data contained in that cell.

The wisest thing to do is to set the global format to the format that will be most often used in your model, then change the exception cells to more appropriate formats individually as follows:

Move the marker to the cell you wish to format. In this case, you want to format cell B6.

Now type:

/F

The format prompt that you saw when you performed the global format will appear on the prompt line:

FORMAT: D G I L R $ *

This time, instead of selecting the dollar sign ($), type I for integer.

Notice how the number is displayed as a whole number? If your number had been 65.7, the integer format would have rounded up following the rounding rule: Less than half rounds down, half or greater rounds up.

Format the rest of the numbers in column B as integers.

Do you notice anything else that would make the worksheet more attractive?

How about right justifying the column headings?

Right justification is done just like integer formatting:

- Move the marker to the cell you want to format (in this case B4)
- Type /F

Your familiar prompt line will appear, offering you a variety of formatting choices. This time:

- Type **R** (for right).

The text in the cell will immediately jump to the right hand side of the marker. This feature is excellent for column headings because numbers automatically right justify.

Now follow the same procedure for C4 and D4.

Your demonstration model should look just like our example.

PROGRAM DOCUMENTATION
PLANNING MODEL

TASK	HOURS	RATE	COST
RESEARCH	65	24.48	1591.20
FIRST PASS	112	24.48	2741.76
EDITING	56	24.48	1370.88
REWRITING	68	24.48	1664.64
TYPESETTING	52	19.00	988.00
PRINTING			10547.00
TOTAL	353		18903.48

Figure 1. The Demonstration Model

35. PLAYING "WHAT IF . . . ?"

A forecasting model is never a static entity. What if we assume that we can get the first pass done for 25% less per hour. How will that affect the total cost? Let's ask ACECALC and find out.

Move the marker to the rate figure for first pass in cell C7. Right now that cell contains the number 24.48, as you can see on the contents line. We want to replace that number with the number that represents 75% of the number that is currently in there. We could type this in, but there is another way to do it: Type a plus sign (+) to indicate that a formula is forthcoming, then either type the coordinate C7, or move the marker back and forth to bring the coordinate onto the entry line. Since what we're really interested in is the value in the cell, and not the coordinate, let's just fetch the value out by pressing the pound sign (#).

You'll see the + C7 immediately replaced by the value from the cell: 24.48.

Now you can continue with the formula by typing:

*.75

to multiply the old value by .75. You may enter the formula as it is, or you may use the immediate calculation feature to enter a value, rather than a formula.

As soon as you enter the new information, the cost figure for first pass, and the total cost are recalculated to reflect the current data.

Obviously, this example is somewhat trivial, but the power of this interactive recalculation should be readily apparent, especially if you are watching annual totals based upon changing assumptions, or bottom line figures based upon package bids submitted by various suppliers.

36. DELETING A DISKETTE FILE

Since you'll only be keeping one version of the PRO-GRAM PLAN model from now on, you have no further need for PROGRAM PLAN 1, so you might as well delete it from your storage diskette.

To delete a file from a diskette.

1. Make sure the diskette you're deleting from is in one of your disk drives.

Your ACECALC storage diskette should still be in the disk drive, so just go on to step 2.

2. From calculator mode, type /S (for Storage).

The familiar prompt message:

ENTER LOWER RIGHT OR RETURN

will appear on the prompt line.

press the RETURN key to enter the File Subsystem.

3. Make sure the Disk Slot and Disk Drive numbers on the menu are the correct ones for the disk drive you're using.

In this case, the slot and drive numbers should already be set correctly from your last Storage operation, so just go on to step 4.

4. Select option 9 — DELETE A FILE by number, or by moving the highlight bar.

A catalog of the files on your disk will be displayed, as in the Save and Load command.

The file you wish to delete is PROGRAM PLAN 1. You've now learned two different ways to supply a file name to the File Subsystem. (1) use the name you see in the catalog; (2) use the number to the left of the name in the catalog.

5. When the file name or number is correct on the entry line, press the RETURN key to complete the deletion.

   CAUTION: As soon as you press RETURN, the file you've specified will be *erased permanently* from the diskette, and you will not be able to get it back. Be sure this is really what you want to do!

When the deletion is complete, the new catalog (without PROGRAM PLAN 1) will be displayed on your screen. This to let you know that what you specified actually took place.

Note: If you change your mind about deleting the file, or have selected option 9 — DELETE A FILE by mistake, use the ESC key to back out of this command.

37.   MORE WHAT IF. . . ?

Let's play a few more "what if...?" games with our numbers to demonstrate the flexibility of ACECALC.

We have made no provision for overhead allowance. Project overhead typically varies from 20 to 40% of the total time (hence cost) of the project.

This means that our cost formula must be modified to include an overhead number.

Currently, we define cost as rate * hours. What we really mean to do is define cost as: rate * hours * (1 + overhead%).

Notice the parentheses in the new formula? ACECALC will evaluate everything in parentheses before anything else. Here's an example:

24.48 * 65 * 1 + .20 = 1591.40

24.48 * 65 * (1 + .20) = 1909.44

ACECALC evaluates expressions in a left to right fashion, except as altered by the use of parentheses.

So our formula in D6 really ought to be:

+ B6*C6*(1 + .20)

Now, let's change all the other formulas in column D to reflect the change. To do this, we use the Reproduce command.

Simply type:

/R

The prompt line will change to read:

REPRO: (, SOURCE RANGE OR RETURN

and the coordinate D6 will be filled in on the entry line.

Since D6 is indeed the source coordinate, simply type RETURN or colon (:) to separate the source from the destination. Now the prompt line will request:

REPRO: ENTER TARGET RANGE OR RETURN

You may specify the cells D7 through D10 either by pointing with the marker, or by typing them in directly. The finished entry for the Reproduce command is:

D6:D7...D10

As soon as you press RETURN, you will be prompted:

REPRODUCE: N = NO CHANGE, R = RELATIVE

Just as before, you want both column B and column C treated in a relative fashion In the reproduction. Simply type R twice.

In the blink of an eye, your model is recalculated to reflect the new formula, and the total of column D is adjusted appropriately.

Remember we said that the overhead could vary? The formula we entered still relies on a static overhead number. Changing the formula each time we want to see the effect of a different overhead percentage is one way to play "what if...?"

Perhaps a better way to test the effects of overhead on the bottom line is to create a new cell to contain the overhead percentage and make the formulas in column D dependent on the current value of that cell. Let's do that now.

Move the marker to row 4 (your column titles), and insert two rows by typing:

/IR

/IR

Now you should have two extra blank rows between your worksheet title and you column titles. Move the marker to cell A4 (if it is not already there).

Type the title:

OVERHEAD

Move the marker to cell B4, and enter the proposed overhead figure of 27% by typing:

27

Now, move the marker to cell D8 and edit the formula there as by typing:

/E (for edit)

Move the cursor to the close parenthesis, and use the ESC key to erase the .2 (press ESC twice).

Now type in the following replacement:

(B4/100)

The reason we use the parenthesized expression (B4/100) is that we expressed the percentage in cell B4 as a whole number, but we can only use it in our formula as a decimal fraction. Remember that the parentheses indicate an expression that ACECALC must evaluate before any others.

The final formula on the entry line will be:

+ B8*C8*(1 + (B4/100))

To clarify the order of evaluation of this formula, let's take it step by step, just as ACECALC will.

1. Get value from cell B8.

2. Multiply it by the value in cell C8.
3. Encountered a parenthesized expression — save the current value, which is B8*C8 and evaluate the expression within parentheses).

4. 1 + oh, oh — another parenthesized expression — save off the current value, which is 1, and evaluate it.

5. Get value from B4.

6. Divide by 100.

7. Fetch the last value outside the parentheses (which is 1), and add.

8. Back out of another level of parentheses — get the saved value (which is B8*C8) and multiply.

That may seem like a lot of steps, but it is important to bear this *order of evaluation* in mind when writing formulas.

Now, reproduce the formula in cell D8 into cells D9 through D12.

To demonstrate the kind of flexibility you've now built into your model, move the marker to cell B4 (the overhead percentage cell), and change the percentage figure. Your cost column will automatically adjust to reflect the new overhead figure.

38. PRINTING THE WORKSHEET

If you have a printer connected to your Ace 1000 computer, you can use it to print "hard copies" of the worksheet displayed on your screen.

To print a hard copy of the worksheet:

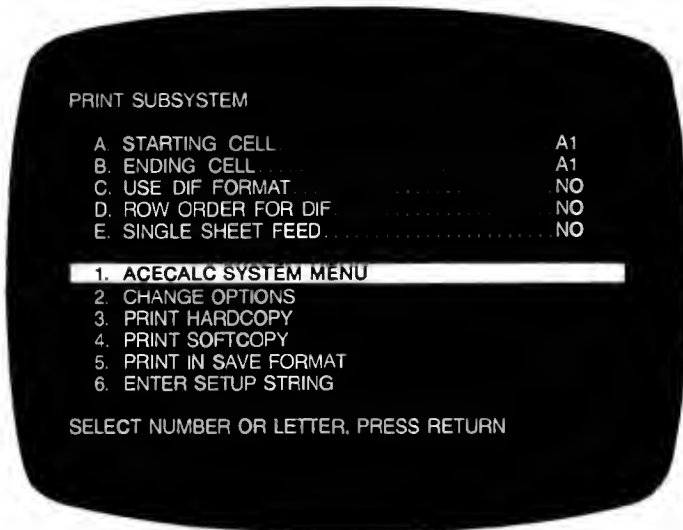1. From calculate mode, type /P (for Print).

The message:

ENTER LOWER RIGHT OR RETURN

will appear on the prompt line.

2. If you wish to print the entire worksheet (which is the normal case), simply press RETURN, otherwise enter the lower right coordinate of the rectangle of cells you wish to print. You may also point with the marker at this cell.

When you press RETURN, you will be placed in the *Print Subsystem*.

```
PRINT SUBSYSTEM

  A. STARTING CELL                              A1
  B. ENDING CELL                                A1
  C. USE DIF FORMAT                             NO
  D. ROW ORDER FOR DIF                          NO
  E. SINGLE SHEET FEED                          NO

  1. ACECALC SYSTEM MENU
  2. CHANGE OPTIONS
  3. PRINT HARDCOPY
  4. PRINT SOFTCOPY
  5. PRINT IN SAVE FORMAT
  6. ENTER SETUP STRING

SELECT NUMBER OR LETTER, PRESS RETURN
```

The Print Subsystem has a menu much like that of the File Subsystem.

Printers are conventionally connected in slot 1, but you can use any slot except 0. If your printer is not in slot 1, you will have to alter the configuration (see discussion of Configuration Subsystem in the Reference Guide).

Notice options A — STARTING CELL, and B — ENDING CELL. The starting cell is taken from the position of the marker on the worksheet when the Print Subsystem is invoked. You may change that now, if it is incorrect. The ending cell is set to the last cell containing data.

These cells describe the upper left corner and lower right corner of a rectangle of *block* of cells. This is the area that will be sent to the printer.

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If you position the marker to cell A1 before typing the /P command, you will almost always get the correct coordinates for these options.

Some printers require a set of control characters to control such things as pitch, inter-line spacing, density of matrix, etc. Such setup strings will be described in your printer manual, but we will provide two examples here.

Select option 6 — ENTER SETUP STRING the same way as you selected items from the File Subsystem menu.

The prompt at the bottom of your screen will change to read:

USE CNTRL-R FOR (RETURN)

Now, let's take the Epson printer as an example. In order to print in condensed mode, you must issue a setup string of:

Ctrl — O

You may find the ASCII codes in your Ace 1000 reference manual. Some printer manuals refer to the control codes by their ASCII names — for example, Ctrl — O is also called SI (for shift in). In these cases, you do not send the letters S and I, you must look up the SI code in the ASCII chart (it has a decimal value of 15), then find the Ctrl key that generates that code.

Once you have entered the Ctrl — O, press RETURN, and you will be back to the menu mode.

Unfortunately there are very few standards in the world of printers. As a matter of fact, you can be assured that what works for one brand will probably not work on another. For example, the C. Itoh Prowriter printer requires the following setup string to set condensed mode:

ESC Q

Covering the various features of different printers is beyond the scope of this manual. These examples were included as examples to demonstrate the technique for entering a setup string.

In order to actually begin the printing process, select option 3 — PRINT HARDCOPY.

The prompt:

**POSITION DOCUMENT
THEN PRESS (RETURN)**

will appear in the middle of your screen. Make sure that the paper in your printer is lined up correctly, and everything is ready (printer on line, etc.), then press the RETURN key.

Your Program Documentation Planning Model will begin to print as soon as you hit the RETURN key.

Note: If you need to interrupt the printing operation for any reason (if you've made a mistake in specifying the print options, for example), type ESC. The printer will immediately stop printing after the printer's buffer is empty and you will be returned to the Print Subsystem menu.

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